

## **REMARKS**

### **Status**

Claims 1-30 were originally filed. In response to a restriction requirement, claim 25 was canceled. By the present amendment, claims 10 and 27-30 have been canceled, and new claim 31 has been added. Accordingly, it is now claims 1-9, 11-26 and 31 which are at issue.

### **The Office Action**

In the Office Action mailed March 29, 2005, then pending claims 1-24, 26 and 28-29 were rejected, and claims 27 and 30 were objected to.

Specifically, claims 1-9, 13 and 17-24 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent 6,524,744 of Clerc. Claims 1-5, 7-8, 10-23 and 26 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent 6,544,687 of Sato. These same claims were rejected under 35 U.S.C. §102(b) over the corresponding PCT filing of Sato, WO 01/03210. Claims 1, 3-4, 8 and 15-23 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 6,492,063 of Ikeda. Claims 1, 3-5, 7-11, 13 and 17-24 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent 6,824,921 of Sato. Claims 26 and 28-29 were rejected under 35 U.S.C. §102(b) as being anticipated by the publication of Yoshimura (Scripta Mater, 2001, 44, pg. 1517-1521).

In addition, claims 21-24 were rejected on the grounds of obviousness-type double patenting over claims 1-4 of U.S. Patent 6,524,744. Claims 27 and 30 were indicated as embodying allowable subject matter, but were objected to as being dependent upon a rejected base claim.

Applicant thanks the Examiner for the search, the thorough explanation of the basis of the rejections, and for the indication of allowable subject matter.

### **The Present Invention**

Applicant will briefly recapitulate the principles of the present invention so as to better clarify how the present invention differs from materials of the prior art.

The present invention is directed to a nanocomposite material having particular utility as an electrode material for lithium ion batteries. The material of the present invention includes two separate phases. A first phase is comprised of an electrochemically active material. As is understood in the context of this disclosure, an electrochemically active material is one which, when employed in a lithium battery, operates to reversibly store and discharge lithium therefrom. In this regard see, for example, the passage at page 4, line 21 to page 5, line 2 of the present specification. It is a notable feature of the present invention that this electrochemically active material is amorphous (see page 5, lines 2-5). In particular instances, the electrochemically active material is an amorphous metal or metal alloy, such materials also being referred to as metglasses (see page 7, lines 7-8).

In accord with a further feature of the present invention, the material also includes a stabilizer phase. This stabilizer phase is configured as a plurality of spaced apart regions dispersed through the electrochemically active material. As is now recited in the claims, these spaced apart regions have a size in the range of 10-100 nanometers. Furthermore, these regions of the stabilizer phase can also include nanocrystalline domains therein, and these domains can have a size in the range of 10-30 nanometers (see for example claim 6). As is detailed in the specification, the stabilizer phase operates to preserve and enhance the activity of the electrochemically active material. As such, materials of the present invention, when incorporated into lithium batteries, exhibit very efficient charge and discharge characteristics as well as very good stability during storage and use.

The prior art, as will be explained hereinbelow, nowhere shows or suggests any material which comprises an electrochemically active, amorphous material having dispersed therein a stabilizer phase of any type, much less a stabilizer phase having a size in the claimed range of 10-100 nanometers, dispersed therethrough.

### **The Rejections**

#### **I. The Rejections Based Upon U.S. Patent 6,524,744 of Clerc**

Claims 1-9, 13 and 17-24 were rejected under 35 U.S.C. §102(e) as being anticipated by the '744 patent of Clerc. Applicant notes that by the present amendment, the limitation of claim 10, namely that the spaced apart regions of the stabilizer material have a size in the range of 10-100 nanometers, has been incorporated into independent claims 1 and 21. Accordingly, those claims, and all claims dependent thereupon, now overcome the rejection based upon the '744 patent of Clerc.

Applicant further notes for the record that even in the absence of such amendment, the claims at issue would be patentable over the teaching of the '744 patent. Specifically, the '744 patent, which is owned by the assignee of the present application, is directed to an electrode material for lithium batteries, which material is fundamentally different from that of the present invention. The '744 patent shows an electrode material having a matrix of an electrically conductive ceramic material having an electrochemically active material dispersed therethrough in the form of small regions. The matrix material of the '744 patent forms a continuous phase having the electrochemically active material dispersed therein. In this regard, the matrix material is of a configuration which is exactly opposite that of the stabilizer material of the present invention. Furthermore, there is no teaching in the '744 patent of the matrix material functioning in any manner in accord with the stabilizer material of the present invention.

The material of the '744 patent further includes an electrochemically active material dispersed in the matrix. Again, this is directly opposite the configuration of the present material which instead includes a stabilizer which is nanodispersed through a body of electrochemically active material. Furthermore, the electrochemically active material of the present invention is amorphous, and the '744 patent includes no teaching in this regard.

Thus, in summary, Applicant respectfully submits that the material of the '744 patent differs significantly in form from that of the present invention insofar as it shows an electrochemically active material dispersed in a conductive ceramic matrix, while the present invention shows a stabilizer material which is nanodispersed through a body of amorphous electrochemically active material. In view of the amendment to the claims, as well as these remarks, Applicant respectfully submits that the rejection based upon the '744 patent is clearly overcome.

## **II. The Rejections Based Upon U.S. Patent 6,544,687 and PCT WO 01/03210**

Claims 1-5, 7-8, 10-23 and 26 were rejected under 35 U.S.C. §102(e) and §102(b) respectively in view of the Sato patent and PCT publication.

Applicant respectfully submits that the subject matter of the claims at issue is not shown or suggested in either of the Sato patents. The Sato patents, both of which include the same disclosure, are directed to a lithium battery having a negative electrode material comprised of a single phase, solid solution of particular elements. While various of the elements comprising the solid solution electrode material of Sato may be utilized in various embodiments of the present invention, the Sato disclosures in no way show or suggest a nanocomposite material of any type, much less a material having (1) an amorphous, electrochemically active material and (2) a stabilizer material configured as a plurality of spaced apart regions in the size range of 10-100

nanometers (3) dispersed in the electrochemically active material. In contrast, the material of Sato is a solid solution comprised of crystalline and not amorphous materials. The passage beginning at column 5, line 33 of Sato makes clear that the electrode material disclosed therein is (1) a solid solution of a (2) crystalline material. There is no teaching whatsoever in Sato of any amorphous, electrochemically active material, nor is there any teaching of such a material having a nanodispersion of a stabilizer material disposed therein. In view of these remarks, and the amendments presented herein, Applicant respectfully submits that the pending claims are all patentable in view of the Sato publications. Reconsideration and withdrawal of the rejections is respectfully requested.

### **III. The Rejections Based Upon U.S. Patent 6,492,063 of Ikeda**

Claims 1, 3-4, 8 and 15-23 were rejected under 35 U.S.C. §102(b) as being anticipated by the '063 patent of Ikeda. By the present amendment, Applicant has incorporated the subject matter of claim 10, which was not rejected under the '063 patent, into claims 1 and 21. Accordingly, those claims, and all claims dependent thereupon, are patentable over the '063 patent.

### **IV. The Rejection Based Upon U.S. Patent 6,824,921 of Sato**

Claims 1, 3-5, 7-11, 13 and 17-24 were rejected under 35 U.S.C. §102(e) in view of the '921 patent. This patent, like the other patents of Sato discussed above, discloses a solid solution electrode material based upon intermetallic compounds. The electrode material of the '921 patent, like that of the other Sato patents, is a crystalline material. It does not include any amorphous material, much less an electrochemically active amorphous material. Furthermore, it does not include any stabilizer material, much less a stabilizer material configured as a plurality of spaced apart regions having a size in the range of 10-100 nanometers. In the Office Action,

the Examiner references a passage at column 8, lines 64 and following where the particular electrode material of the '921 patent is described as having a particle size of approximately .7 microns and a "low crystalline or amorphous" structure. While this passage can be understood to mean that the overall material of the '921 patent may, in some instances, be amorphous, it in no way teaches a composite, multiphase, material having an amorphous, electrochemically active material with a nanodispersed stabilizer material disposed therein. All teaching is to a single phase material. Accordingly, Applicant respectfully submits that the '921 patent in no way shows or suggests the presently claimed invention. Reconsideration and withdrawal of this rejection is respectfully requested.

#### **The Rejection Based Upon the Yoshimura Publication**

Claims 26 and 28-29 were rejected under 35 U.S.C. §102(b) in view of the Yoshimura publication. Claims 27 and 30 were indicated as embodying allowable subject matter. By the present amendment, the limitation of claim 27 has been inserted into claim 26, and this claim is now allowable. Claims 27-30 have been canceled, and new claim 31 has been presented. Claim 31 tracks original claim 26, and includes the further limitations of claim 30 and intervening claim 28 therein. New claim 31 is likewise allowable.

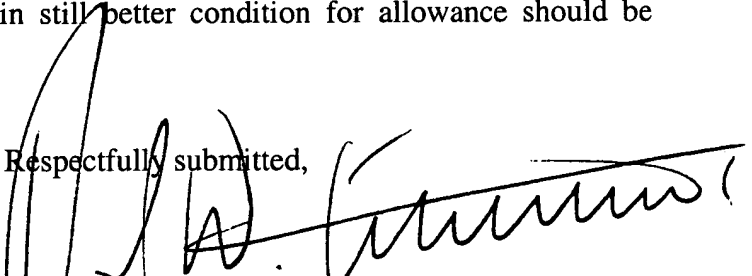
#### **The Double Patenting Rejection**

Claims 21-24 were rejected on the grounds of obviousness-type double patenting in view of claims 1-4 of the '744 patent. Applicant respectfully submits that in view of the present amendment and remarks submitted herein which clearly distinguish the presently claimed invention from the material of the '744 patent, all rejections based upon the '744 patent are overcome.

**Conclusion**

By the present amendment, Applicant has overcome all outstanding rejections. The application is in condition for allowance. Any questions, comments or suggestions the Examiner may have which will place the application in still better condition for allowance should be directed to the undersigned attorney.

Respectfully submitted,

  
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Janice Burkhardt